

D W R

NEWS

DEPARTMENT OF WATER RESOURCES

After *forty* Years

Milestones
for DWR

1956
1996

Fall 1996



DWR Mission Statement

To manage the water resources of California, in cooperation with other agencies, to benefit the State's people and protect, restore and enhance the natural and human environments.



Contents

Fall 1996

Cover story

4

After Forty Years *by Pete Weisser*

Milestones and memories fill four decades since DWR's creation.

12

From Controversy to Cooperation *by Joyce Tokita*

The story behind Lake Oroville reveals how conflict led to a happy ending.

20

Home Stretch for the Coastal *by Jeff Cohen*

DWR's largest undertaking is coming to an end.

28

Mission Impossible *by William Draper*

CALFED manager Lester Snow and staff tackle an up-to-now unsolvable dilemma for the Bay-Delta Estuary.

34

Different Times *by Joyce Tokita*

After 50 years, there's new life for an old bulletin.

39

Pictorial - At the End of the Line

A look at how DWR engineers are getting close to radial gates.

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comments or story ideas are

welcomed by the DWR NEWS editors.

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After forty Years

Milestones
for DWR

by Pete Weisser

The Department of Water Resources' legacy predates its legislative birth in 1956. Decades before, with the creation of the Office of State Engineer and the appointment of William Hammond Hall in 1878, investigations were conducted of irrigation, drainage and river navigation. Suggestions were made that the water of the Great Central Valley be developed.

During the years and organizational evolutions that followed, the focus remained on delineating California's water problems, forecasting future water supply needs, evaluating and inventorying existing water resources, and exploring their potential to meet an ever-growing population. All this eventually led to the initial California Water Plan of 1957 and a proposed Feather River Project, a system of dams, reservoirs, aqueducts, and pumping and power plants now known as the State Water Project.

In the meantime, the Department added new responsibilities: flood control, design and construction of water facilities, and dam safety. The employee ranks in turn grew from 450 in 1956 to more than 4,500 in 1967.

Today, with a staff of approximately 2,800 and a \$1 billion annual budget, the Department administers increasingly complex programs involving flood control for the Central Valley, dam safety for more than 1,200 dams statewide, local assistance projects, water management strategies, water quality improvement programs, and water supply data collection and studies. DWR staff provides technical and financial assistance to local water communities, works with a number of governmental and wildlife agencies on environmental issues and projects, manages SWP

and Reclamation Board lands, educates the public about California's water resources, and operates and maintains the State Water Project, one of the largest water development and distribution systems in the nation.

On July 5, 1996, the Department of Water Resources observed its 40th anniversary. Here are a few of the milestones in DWR's four decades of service to California.



1956

Special session of the Legislature, called by Governor Goodwin J. Knight, creates a single State Department of Water Resources. It replaces the State Engineer's Office, the Water Project Authority, the State Water Resources Board, and the Division of Water Resources of the Department of Public Works. (Water rights jurisdiction are assigned to another new agency—the State Water Rights Board. In 1967, its functions are taken over by the State Water Resources Control Board.)

On July 5, 1956, the State Department of Water Resources comes into existence.

The new Department is organized with a Division of Resources Planning, Division of Design and Construction, Division of Administration, and a Southern California District.

DWR also acquires the duties of the State Water Board, later renamed the California Water Commission.

Governor Knight appoints a distinguished consulting engineer—Harvey O. Banks—to be its first Director. Banks serves as DWR Director from 1956-1961. (Mr. Banks died Sept. 22, 1996.)



1950s



1957

The Department completes the California Water Plan (Bulletin No. 3). It presents preliminary plans for developing all of the state's water resources to meet its ultimate water needs. Those plans include a system of reservoirs, aqueducts, pumping and power plants that would transport water from areas of surplus in the north to the water deficient south.

Bulletin 3 became the foundation for a series of water plan updates, known as the Bulletin 160 series. The update was published six times between 1966 and 1994. Each bulletin described California's water use and supply at the time of its publication, projected future water needs, and provided information to guide beneficial use of the State's water resources. The Department is now working on Bulletin 160-98.

Tunnel excavation at Oroville

State engineers recommend alternative routes for aqueduct systems to serve Southern California.

The Legislature enacts Burns Porter Act, providing initial funding of \$1.75 billion in general obligation bonds and authorizing construction of its facilities.

The Legislature changes the name of the State Water Board to the California Water Commission and increases its membership from seven to nine.

1959



1960

California voters approve the Burns-Porter Act to finance construction of the State Water Project.

Whale Rock Dam, located near San Luis Obispo, is completed to meet the county's water needs. It was the first major dam designed and constructed by DWR.



1961

On January 1, William E. Warne is appointed Director. Warne serves until December 31, 1966. (Mr. Warne died March 9, 1996.)

The Department is reorganized with the Division of Resources Planning split into four branches situated in Sacramento, and a headquarters staff. The branches are the Bay Area, Delta, Northern and San Joaquin Valley, and a Technical Services Office. The Division of Operations and Maintenance is added, as well as the Division of Design and Construction, which was established, approved and financed by the Burns-Porter Act.

Construction begins on State Water Project facilities, including Oroville Dam, key water storage facility on the Feather River in the upper Sacramento Valley.

California and the U.S. Government sign an agreement to build the San Luis Joint-Use Facilities for storage, pumping and conveyance for state-federal water operations.



1962

President John F. Kennedy and Governor Edmund G. Brown, Sr. join in a dedication ceremony for the San Luis Dam and Reservoir in the San Joaquin Valley west of Los Banos. (Governor Brown, a leader in developing the State Water Project, served as California's Governor from 1959 to 1967. The California Aqueduct was renamed the Edmund G. Brown California Aqueduct in his honor in December 1982. He died on February 16, 1996.)

Oroville Dam construction



1963

Construction begins on San Luis Dam. The San Luis Reservoir is planned for joint use by the SWP and the federal Central Valley Project, since both systems require storage of surplus flows pumped from the Delta.

Construction begins on the Harvey O. Banks Pumping Plant in the South Delta, starting point of the California Aqueduct.

The Power Office is created in October.

The San Joaquin District is established in Fresno.

Resources Building, Sacramento



1964

December storms cause severe flooding along North Coast rivers, including the Smith, Eel and Van Duzen. December flooding on the Feather River is checked by the partly-completed Oroville Dam.

DWR moves into the Resources Building from 19 locations in Sacramento. The building is dedicated on January 8, 1965. (Standing 246 feet high, it was the tallest building in Sacramento at the time.)



1965

Construction begins on A.D. Edmonston Pumping Plant, largest pumping facility of the State Water Project. The plant will lift water almost 2,000 feet up and over the Tehachapi Mountains into Southern California. At peak capacity, the plant pumps almost 2 million gallons a minute through 10 miles of pipeline across the Tehachapi Mountains.

The new Division of Safety of Dams is created on July 1.

Bay Area District is established in Vallejo. It closes in 1968 and merges with the Sacramento District to form the Central District.



1967

Effective January 1, Governor Ronald Reagan appoints William R. Gianelli as DWR Director. Gianelli serves until April 1973.

Feather River Salmon and Steelhead Hatchery below Oroville Dam opens to help compensate for the loss of natural spawning areas to the dam.

Construction is completed on Oroville Dam. At 770 feet high, Oroville Dam is the tallest earthfill dam in the nation. Its reservoir is the largest in the SWP, with a capacity of 3.5 million acre-feet.

Construction is completed on the San Luis Dam. With a capacity of two million acre-feet, the San Luis Reservoir in the eastern foothills of the Diablo Mountain Range, is the largest off stream reservoir in the United States.



1968

Electric power generation begins at Oroville Dam.

On April 3, the Department sells \$150 million in bonds to pay for construction costs of the Oroville Division power facilities. This is the first sale of revenue bonds to finance SWP construction. (The Department was able to retire the 50-year bonds by April 1, 1994.)

Banks Pumping Plant is completed. With seven units, its pumping capacity is 6,400 cubic feet per second. (In 1991, four more units are added, boosting total capacity to 10,300 cfs.)

Feather River Fish Hatchery





1969

1971

1973

1975

1977

1979

1981

1982

1983

1984

The Reclamation Board staff and responsibilities are transferred to DWR.

The Power Office becomes a branch of the Division of Operations and Maintenance.

On July 12, a ceremony sponsored by the American Society of Civil Engineers is held atop the crest of Oroville Dam. It designates the dam and Edward Hyatt Powerplant as the "Outstanding Civil Engineering Achievement of 1969."

On October 8, Governor Ronald Reagan starts the first pump at A.D. Edmonston Pumping Plant, as part of a ceremony celebrating the first water deliveries to Southern California.

Initial facilities of the State Water Project are completed. John R. Teerink, a career DWR engineer, is appointed Director. He serves until 1975. (Teerink was killed in an automobile accident on July 30, 1992.)

Governor Edmund G. Brown, Jr. appoints Ronald E. Robie, an attorney and legislative consultant on water law and policy, as DWR Director. Robie serves until 1983.

The State Water Project Analysis Office is established to handle contract administration and negotiations, as well as project repayment and financial analysis for the SWP.

The California Cooperative Snow Survey Program celebrates its golden anniversary, as does the Dam Safety program.

The Office of Water Conservation is established to bring together urban and agricultural conservation efforts.

On Sept. 27, Governor Brown signs SB 201 authorizing the Department to spend over \$2 million to distribute household water conservation devices and another \$600,000 for water conservation education for school children.

**DWR
TURNS
25**

DWR celebrates its 25th anniversary at the Sacramento Convention Center.

Voters reject Proposition 9 (SB 200) to build a Peripheral Canal along the eastern edge of the Delta. (In 1977, DWR had proposed a combination of state-federal programs and facilities, including a 42-mile canal to bypass the Delta and more efficiently move water from the Sacramento River south to CVP and SWP pumping plants. These later evolved into Senate Bill 200.)

David N. Kennedy, an engineer and water industry executive who worked for DWR as an engineer in the 60s, is appointed Director of DWR by Governor George Deukmejian.

DWR becomes a bulk power agency to better manage its power needs, making the State Water Project the fifth largest electric utility in California. (DWR is also the twelfth largest public owned electric system in the nation.)

The Legislature authorizes construction of Los Banos Grandes, a 1.75 million acre-foot offstream reservoir south of the Delta. It would benefit the Delta by increasing export pumping flexibility to offset impacts on Delta fish. (The project is on hold pending a Bay-Delta solution.)

1970s



Control panel at A. D. Edmonston Pumping Plant

First water deliveries to Southern California



Switchyard at A.D. Edmonston Pumping Plant

Proposed Los Banos Grandes Reservoir site.



1980s



1986

DWR and the Department of Fish and Game sign an agreement to determine mitigation measures for the Harvey O. Banks Pumping Plant. It creates a \$15 million program, funded by DWR, to improve striped bass, steelhead and chinook salmon fisheries and offset fish losses caused by water diversions from the Delta.

In February, DWR's Flood Operations Center becomes the headquarters for many Northern California flood fights after torrential rains lash much of the North State for more than a week. Total damage is estimated at more than \$500 million.

The East Branch Enlargement begins to expand the aqueduct's capacity to move more water south during wet years for storage in groundwater basins. The work includes raising the canal lining, building a new power plant, and modifying other facilities.

A ceremony marks the beginning of operations of the Suisun Marsh Salinity Control Gates. The gates will allow fresh water into the marsh to preserve it as the largest contiguous brackish water marsh remaining in the U.S.



1987

The California Legislature recognizes 1986-87 as a critical water year and requests that DWR provide drought contingency planning assistance to the water industry.

The Office of Public Information and Communications (now known as the Office of Water Education) is established.

On November 24, after more than 25 years of negotiations and Congressional approval, Director Kennedy and David Houston, Regional Director, U.S. Bureau of Reclamation, sign the Coordinated Operation Agreement. It ushers in a new era of cooperation in operating the State Water Project and the Central Valley Project.

1987-92

Major California drought impacts SWP water deliveries. DWR operates the Drought Information Center and expands water conservation education efforts.



Towing the Suisun gates



1989

The week of May 1-7 marks the first statewide celebration of Water Awareness Week. The event is later extended over the entire month of May.



Coordinated Operation Agreement signing

1988

After more than two years of planning and negotiating, the Department purchases 19,900 acres adjacent to the Kern River, establishing the Kern Water Bank, a SWP groundwater recharge program. (The Kern Fan Element of the Kern Water Bank was transferred to Kern County Water Agency in August 1996, as part of the 1991 Monterey Agreement.)

1991

Governor Pete Wilson reappoints David N. Kennedy as DWR Director.

DWR initiates a California Water Bank to facilitate transfers and sales of water during drought to meet water needs. The Water Bank was activated in the drought years of 1991, 1992 and 1994.

1992

In April, Governor Wilson announces a long-term comprehensive water policy that takes account of the needs and concerns of each of the major interests in water use and development. It includes fixing the Sacramento-San Joaquin Delta, protecting groundwater resources and fish and wildlife, and promoting water marketing, water conservation and water recycling.



1993

In December, DWR begins construction on a 100-mile Coastal Branch. This pipeline project will allow State Water Project water to be transported to Santa Barbara and San Luis Obispo counties—a drought-vulnerable area—as a supplemental water supply. Completion of this \$530 million project is expected in late 1996.



1994

In July, state and federal agencies sign the Framework Agreement, whose principles set into motion processes to provide more reliable water supplies for Northern and Southern California, protect wildlife in the Bay-Delta ecosystem, and prohibit the listing of more endangered species. To help fulfill the agreement, the CALFED Bay-Delta Program is established and charged with developing long-term solutions to problems in the Bay-Delta estuary.

On December 1, negotiators for DWR and the State Water Contractors reach an agreement, known as the Monterey Agreement, to change contract terms and modernize the way the State Water Project allocates, stores and sells water.

DWR is a leading state agency for the December 15 "Principles for Agreement on Bay-Delta Standards," a major agreement on Delta water supplies, water quality and environmental protection. The Department will also serve as an active partner in the CALFED Bay-Delta Program process.



1995

DWR relocates operational headquarters for the SWP from the Resources Building in downtown Sacramento to a renovated building north of the downtown. The new Joint Operations Center is shared with the U.S. Bureau of Reclamation, operators of the Central Valley Project, and the National Weather Service, a partner in DWR's new Flood Center.

1996

Heavy rain and snowfall during January and February assure ample water supplies for 1996. On March 8, DWR announces it will deliver 100 percent of the water amounts requested (about 2.7 million acre-feet) by its 29 long-term water supply contractors.

DWR and USBR releases environmental documents for a South Delta Program to improve flows for fish habitat, agriculture and water exports. It includes installing three permanent flow control structures and a fish barrier, dredging channels, and constructing a new intake to Clifton Court Forebay.



Oroville Spillway

1990s

FROM Controversy TO Cooperation



By Joyce Tohita

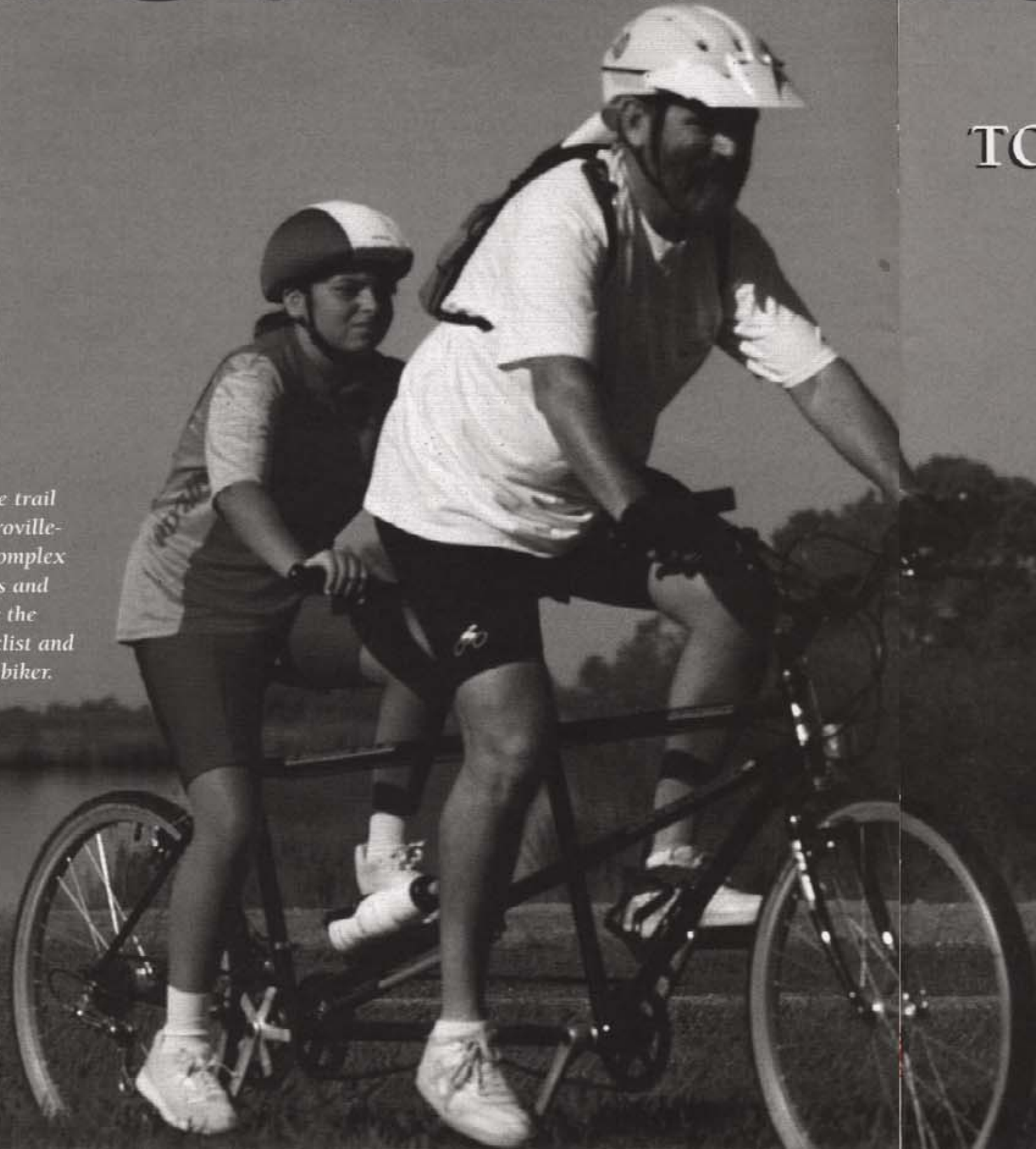
It's summer at Lake Oroville.

Houseboaters, seeking adventure on one of the lake's three forks, plow through the shimmering water.

Anglers throw out their lines, hoping to catch a trophy bass or a tasty salmon.

Equestrians and bicyclists trek along miles of trail. Picnickers spread out their noon-time meals, while campers prepare their sites for the night. And families tour the Oroville Visitors Center to enjoy its exhibits and take in the view from its 47-foot tower.

A 41-mile bike trail around the Oroville-Thermalito Complex includes sights and challenges for the pleasure bicyclist and the mountain biker.





Not far from the lake's main body, sailboats glide silently on the waters of Thermalito Forebay North and South as sun worshippers enjoy the beaches. At Thermalito Afterbay, waterskiers and jetskiers skim along its 4,300-acre surface, as radio-control plane enthusiasts test their skills nearby. Just across the way are areas where ducks can breed, hunters hunt, naturalists observe, and off-highway vehicles roam.

With such variety, Lake Oroville is a recreationist's paradise... but it wasn't always so. In fact much of the lake's new and improved facilities were born of contention between differing views of needs and wants. Its happy ending is a tale of how controversy can lead to cooperation.

In the Beginning

The story starts in 1966, two years before the Oroville Complex is completed and filled. The Department publishes Bulletin 117-6, a recreation report developed with the aid of the Department of Parks and Recreation, that recommends a development plan for Lake Oroville and its off-stream Thermalito features. The plan recommends five beaches, 675 camp units, 605 picnic units, six boat launching ramps with a total of 24 launching lanes, and ample parking for all. Bulletin 117-6 adds that recreation facilities should be provided as demands develop because recreation trends would likely change.

In 1977, the plan was adopted by the Federal Energy Regulatory Commission, which grants the license that allows DWR to operate the power-generation facilities at the Oroville Complex. (When the original license was granted in 1957, a recreation plan was not required. But when FERC amended their regulations in 1965, recreation was written into the license approval process.)

After about a third of the recommended facilities were built, the Department felt that these would be sufficient to meet public demands which had fallen well below the 1.2 million visitors expected by 1977. Operating costs for the Department of Parks and Recreation (responsible for operating and maintaining the facilities) were also exceeding revenues by more than 4 to 1. Plus there was little general fund money available for recreation development.

During inspections in 1980 and 1983, FERC had noted that all the facilities recommended in Bulletin 117-6 had not been completed. FERC acknowledged that the complex had not attracted the projected number of visitors, and concurred with the Department's plan to build facilities as the need developed.

In 1989, however, FERC altered its stance. The agency wanted an explanation as to why DWR was not in compliance with the license's recreation requirement. The Department replied with a letter that basically stated the present recreational use of existing facilities did not warrant any further development at Lake Oroville.

The Scene Changes

When FERC placed a public notice announcing DWR's intention to amend the original plan, it awakened a community which, up to then, had been relatively silent about its displeasure with the lake's recreational status quo. (At about the same time, DPR was proposing increases of recreation fees at Lake Oroville, a move that just fueled the already concerned public.) Newly educated about FERC's licensing requirements and angered by DWR's revised plan, local residents, community groups and fishery organizations sent thousands of protest letters to the federal agency.

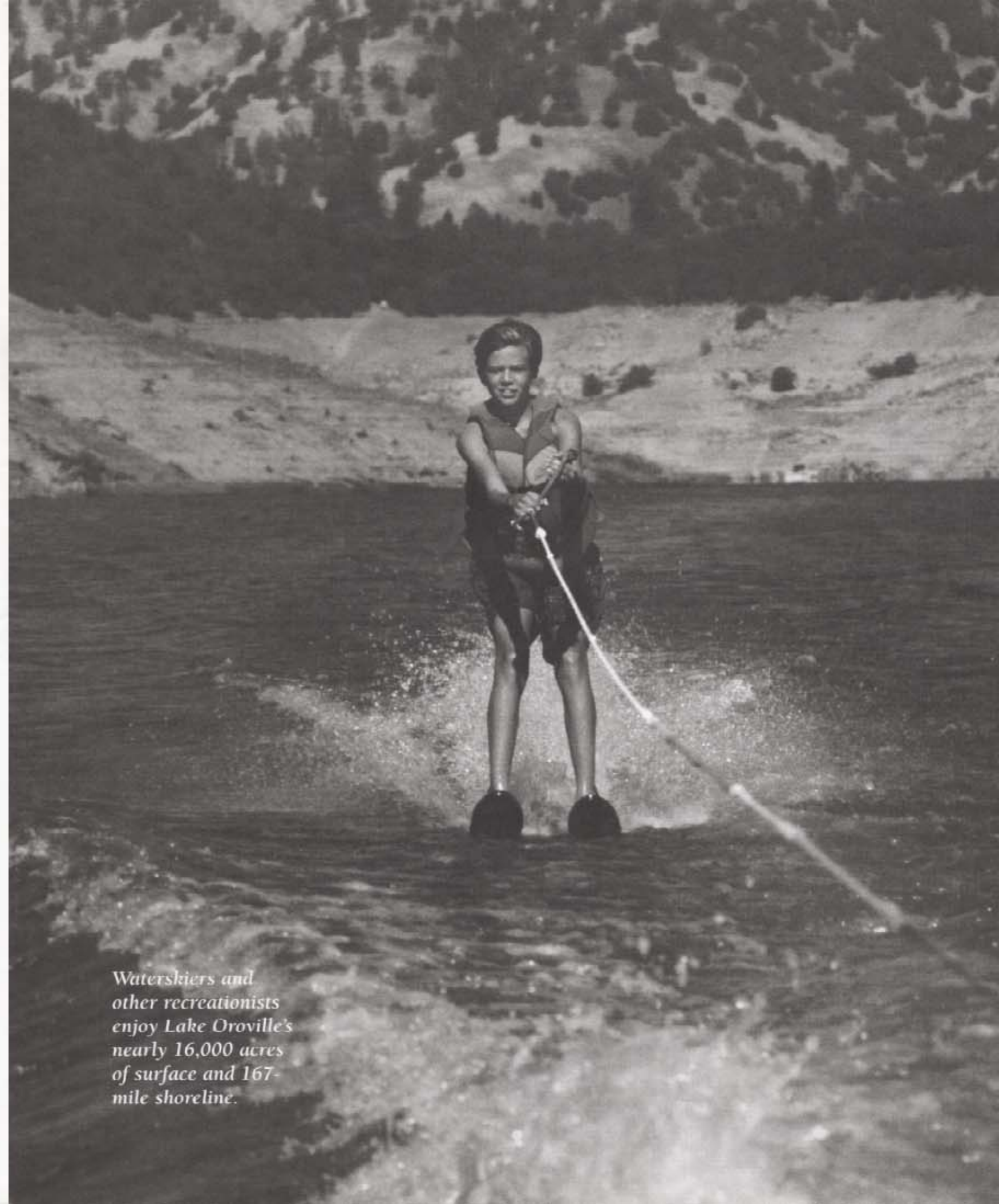
That was the scene Rolland Williams stepped into as he took over as Oroville Field Division chief. It was a situation he was totally unaware of.

"I thought Oroville, a small community, would be more relaxed because of its recreational environment," says Williams, who left behind his responsibilities as operations superintendent in DWR's field division in Southern California. "As soon as I got there, I was meeting with the mayor, the residents, and special interests groups. They were very angry and didn't mind letting everyone else know how angry they were and who the target was."

Dan Peterson, an environmental program manager with the Division of Operations and Maintenance, remembers much the same scenario. "They felt DWR had made promises it hadn't kept. Their local economy was failing, and they saw recreation as an asset. They wanted what they were promised. And they were not afraid to align their Congressman and state politicians on their side."

Williams and Peterson were both embroiled in a number of public meetings that were called after FERC ordered DWR to submit an amended proposed recreation plan. At these open forums, where DWR staff and those from other state agencies were to gather input to prepare the amended plan, many individuals angrily denounced the Department. Some wanted to vent their frustrations, others asked for more than the Department could provide, and a few offered specific proposals.

"The atmosphere was very adversarial and contentious," says Peterson. "But we were there to take notes and listen to what they wanted."



Waterskiers and other recreationists enjoy Lake Oroville's nearly 16,000 acres of surface and 167-mile shoreline.



A Happy Ending

By the end of 1996, about \$11 million of new and improved recreational facilities will be in place around Lake Oroville. There will be new campsites and picnic areas, improved boat ramps, added parking, permanent restrooms, and more.

Already, lights have gone up along the Dam Crest Road with restrooms also available there. Boat ramps have been renovated at North Thermalito Forebay, while South Thermalito Forebay has a new swim beach and picnic area with more trees; and a water system has been installed. At Thermalito Afterbay, two new brood ponds for waterfowl are in place, as are a new boat ramp, new picnic tables, barbecues, and more parking. Skiers can enjoy a designated slalom ski course, and model airplane enthusiasts delight in their upgraded site for takeoffs and landings.

Recently completed are the expansion and renovation of Lime Saddle, one of the first major recreational areas to be developed in the late 1960s. The \$1.5 million project, funded by boat fuel taxes, is being coordinated by the Department of Boating and Waterways. It includes an improved boat ramp, increased parking and lighting, and enhanced landscaping. Lime Saddle's later additions include 25 tent/RV campsites, restrooms and a fish cleaning station.

Equestrians, besides riding the trails around the lake, can now camp out with their horses at a new Loafer Creek facility. With pull-outs for horse trailers, horse showers, feeder stalls, and a bathroom/shower complex for humans,



Equestrian camp facility

the group campsite is "the Cadillac of horse camps," says John Ford, a guide with the Oroville Field Division. "The facility is unique in that most are found in parks geared specifically for equestrian use. Here, it adds to the variety of recreation available."

A 41-mile bike trail circles the North and South Thermalito Forebays, Thermalito Afterbay and the crest of the Oroville Dam. Sections of the trail were used for a California State Series bike competition last May. More than 600 bicyclists vied for points to win championships in the downhill and 22-mile cross-country portions.

Anchored in the lake, ten floating campsites will eventually open for business, each complete with two decks, a gas grill, camp table, sink, restroom, shelves, storage room, cabinets, and sleeping area.

On July 4, 1996 a groundbreaking ceremony hailed the start of construction of an aquatic center at North Thermalito Forebay. It will be used in part as a teaching center. California State University at Chico and the Butte Sailing Club will operate the center.

Plans are also in the works for building new raceways and an added hatching/incubation facility to raise more fish at the Feather River Fish Hatchery. The hatchery's expansion is part of a larger effort to enhance the lake's fisheries. Already in its fourth year, the program includes regular plantings of chinook salmon and brown trout, an ongoing creel census conducted by the Department of Fish and Game to collect data about the plantings, surveys of the lake's forage base which provides the food source for larger fish, and placement of manzanita brush shelters underwater near the shoreline to provide habitat and protection for young fish.

"These recreational facilities owe a large part of their success to the people who did most of the work," says Rolland Williams of his field division staff. That includes the engineers who designed and oversaw construction of the projects, the administrative staff who purchased and stored the needed materials, and the civil maintenance crew who did the physical labor—from paving roads and building restrooms and bridges to installing everything from water and sewer lines, signage along the bike trails, and picnic tables.

"A lot of people put a lot of effort into this program," adds Williams. "Much has been accomplished, and the lines of communications are open. We can only go forward from here."



A day in the sun at Thermalito Forebay includes picnicking, swimming and feeding the ducks.



Community Input

The Oroville Recreation Advisory Committee was formed in 1994 to review and comment on the planning and construction of the facilities outlined in the amended recreation plan for Lake Oroville.

ORAC members include California Department of Water Resources, California Department of Parks and Recreation, California Department of Fish and Game, California Department of Boating and Waterways, California State Water Contractors, Butte County, City of Oroville, Butte County Citizens for Fair Government, California Sports Fishing Protection Alliance, Citizens for Fair & Equitable Recreational Use of Lake Oroville, Lake Oroville Fish Enhancement Committee, Butte Sailing Club, and the Oroville Area Chamber of Commerce.

FERC is using ORAC as a model entity to determine how local input can assist in recreation development required by their licensing process.

The recent renovation and expansion of Lime Saddle included an improved boat ramp and more parking. Its marina is a popular spot to rent houseboats, jet skis and other water craft.



From these notes, Peterson, Williams and fellow DWR staffers Curtis Creel, Dale Hoffman-Floerke, Judy Higley, Ron Landingham, David Sandino, Rita Singer, Jess Whitt, and Mary Witzsche began drafting the proposed amended recreation plan. After several drafts and public reviews, a final draft went to FERC in June 1993. The plan was approved in September 1994.

DWR Takes Action

The Department, however, didn't wait for FERC's approval to begin their work on the new recreation facilities. Williams and his staff immediately began designing and building some of the smaller projects, a move that probably helped calm the local residents' apprehensions about the Department's commitment to Lake Oroville recreation. Open attitudes, on the part of DWR staff, also made the difference in turning a hostile relationship into a more congenial co-existence.

"Whether I agreed with the local community or not was irrelevant," says Williams. "To argue with them would have just increased and magnified the exchanges and in turn increased the time it would have taken for us to come together on the direction needed for the amended plan."

"My approach was to listen to their concerns, bring these concerns back to the Department, and convince others that sometimes we need to go a little above and beyond what we had proposed in the original plan."

Peterson adds, "We might have been a bit resistant at first, but the Department realized that this was the right way, especially in view of our 'commitment to the community' philosophy."

Today, contention seems to have given way to cooperation. After a May tour of the facilities by Oroville Recreation Advisory Council members (see "Community Input" on previous page), the local paper hailed the event "as evidence of a strong partnership between the community and the state" and quoted Dan Cook, ORAC chair, as saying, "It has been gratifying to see the [DWR] response to local concerns about the development of the recreational potential of Lake Oroville. We are now in the position of seeing that dream become reality."

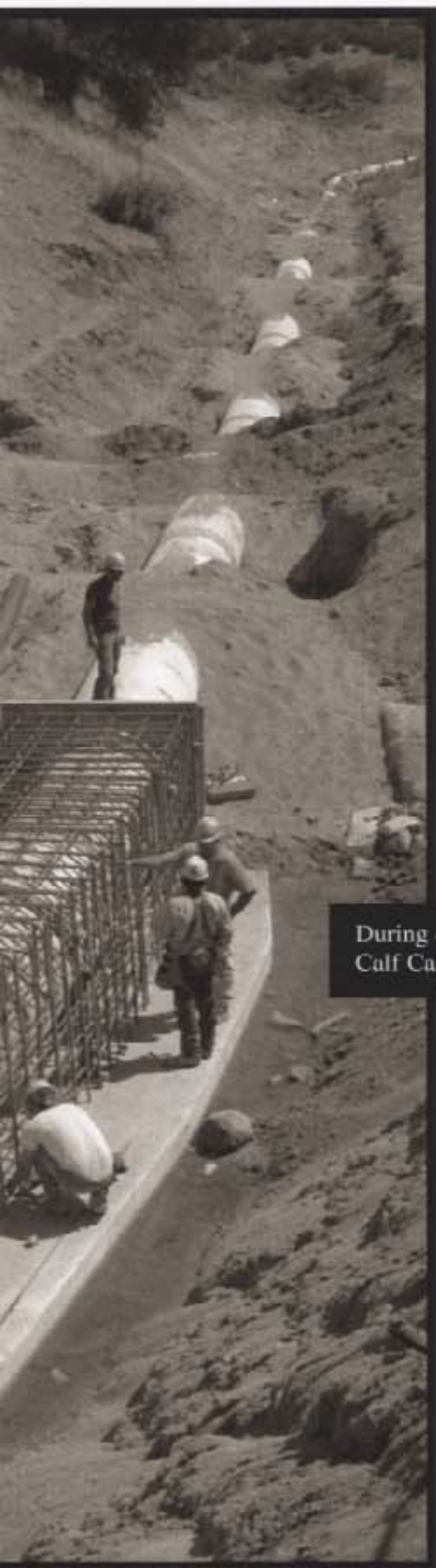
On July 4, 1996 fireworks lit up the skies over Lake Oroville. Sponsored by the local Rotary club (of which Williams is a member) in cooperation with the Department, the celebration again evidenced the rewards of turning controversy into cooperation.



*It's been a long,
hard road to the
finish line for a
decade-long effort
to bring the State
Water Project to
the Central Coast
of California.
It has been an
Olympic-sized event
in engineering
to overcome
geographic barriers,
environmental
sensitivities,
construction
difficulties, and
one of the wettest
winters on record.*

Home Stretch on the Coastal Branch

BY: JEFF COHEN



During construction in Calf Canyon, Reach 3.

After planning, permits, right-of-way acquisition, design, and three years of construction, nearly all the pipeline of the Coastal Branch is welded and laid. Water will flow by year's end.

The locally funded Coastal Branch will provide much needed water from Northern California to a portion of the Central Coast in San Luis Obispo and Santa Barbara counties that has been historically plagued by drought and groundwater overpumping.

Both counties were included in the original State Water Project plan approved by voters in 1960. The Department of Water Resources completed the first phase of the Coastal Branch in Kings and Kern counties in 1968, but Phase II awaited local approval. In 1991, voters in Santa Barbara County agreed to form a local agency, the Central Coast Water

Authority (CCWA), to complete the project to each of its member agencies at a cost now estimated at a half billion dollars. Environmental impact reports were prepared and completed in 1991.

Pipeline deliveries will supplement local water sources and help reduce groundwater overdrafting. The project will eventually deliver as much as 47,816 acre-feet a year. San Luis Obispo County has a right to 4,830 acre-feet a year while Santa Barbara County can receive up to 42,986 acre-feet annually. (An acre-foot is 325,900 gallons, an amount that can serve up to two families a year and cover an acre field with water one foot deep.)

In the three years of building, DWR and CCWA cooperatively worked together to save money, improve schedules, and reduce impacts to private property owners along the project's right-of-way.

The Geographic Challenge

For the first 300 miles, the water will travel from Northern California. It will be stored in Lake Oroville, released down the Feather River to the Sacramento River, drained into the Sacramento-San Joaquin River Delta, and withdrawn at the Harvey O. Banks Delta Pumping Plant. The California Aqueduct will carry it about 185 miles to the turnoff to Phase I of the Coastal Branch.

Phase I, a 15-mile open aqueduct section with two pumping plants built in the 1960s, joins Phase II at Devil's Den in western Kern County. There the water starts its 101-mile pipeline journey with a 1,500-foot lift over the rugged Temblor Mountain Range and the San Andreas Fault up to 2,000-foot-high Polonio Pass. Three pumping plants — Devil's Den, Bluestone (named for the serpentine rock of the area), and Polonio Pass — accomplish this job. Up to 30 million gallons can be stored and chlorinated at the Polonio Pass Tank Site 1 and Treatment Plant. The plant was constructed by CCWA.

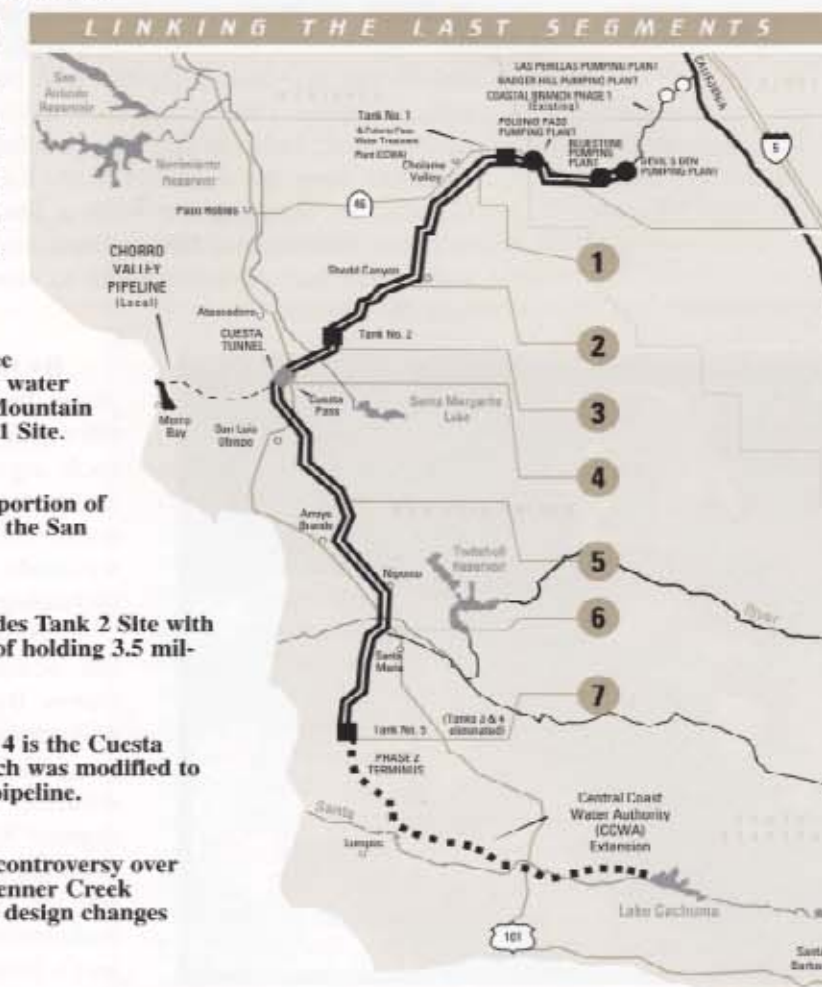
Then the State Water Project pipeline, up to five feet in diameter in some places, begins an 87-mile mostly downhill journey, plunging nearly a thousand feet to the floor of the Cholame Valley, tunneling through rugged Calf Canyon near Atascadero, bypassing Cuesta Grade near the city of San Luis Obispo in a refurbished World War II tunnel, and thrusting through another tunnel in the hills southeast of San Luis Obispo. When the water arrives at Vandenberg Air Force Base in northern Santa Barbara County, it enters a locally owned 42-mile pipeline built by CCWA. The water is then pumped to Cachuma Reservoir near the city of Santa Barbara. CCWA assisted DWR in the design and construction of the 28 miles of the State project south of the city of Arroyo Grande to Vandenberg.



Calf Canyon after construction.

If water delivery were an Olympic diving event, constructing and operating facilities to get water to the Central Coast would rate a high degree of difficulty.

- 1 Reach 1's three pumping plants lift water over the Temblor Mountain Range to the Tank 1 Site.
- 2 In Reach 2, a portion of the pipeline crosses the San Andreas Fault.
- 3 Reach 3 includes Tank 2 Site with two tanks capable of holding 3.5 million gallons each.
- 4 Within Reach 4 is the Cuesta Grade Tunnel, which was modified to accommodate the pipeline.
- 5 In Reach 5A, controversy over the oak grove at Stenner Creek Canyon resulted in design changes and delays.
- 6 For Reach 6 (and Reach 5B), the Central Coast Water Authority assisted with design and construction.
- 7 The end of Reach 6 is where the CCWA Extension begins.



Building in Safeguards

With the Coastal Branch, DWR faced another big challenge: build a pipeline through some of the most environmentally sensitive portions of California while complying with the requirements of several government regulatory agencies. Recognizing the urgent need for the project, the Department began designing to avoid or reduce detrimental environmental impacts. All DWR personnel and construction contractors were trained in their environmental responsibilities before work began. Construction crews were given instructions to avoid sensitive wildlife ranging from the blunt-nosed leopard lizard and San Joaquin kit fox to the burrowing owl and red-legged frog.

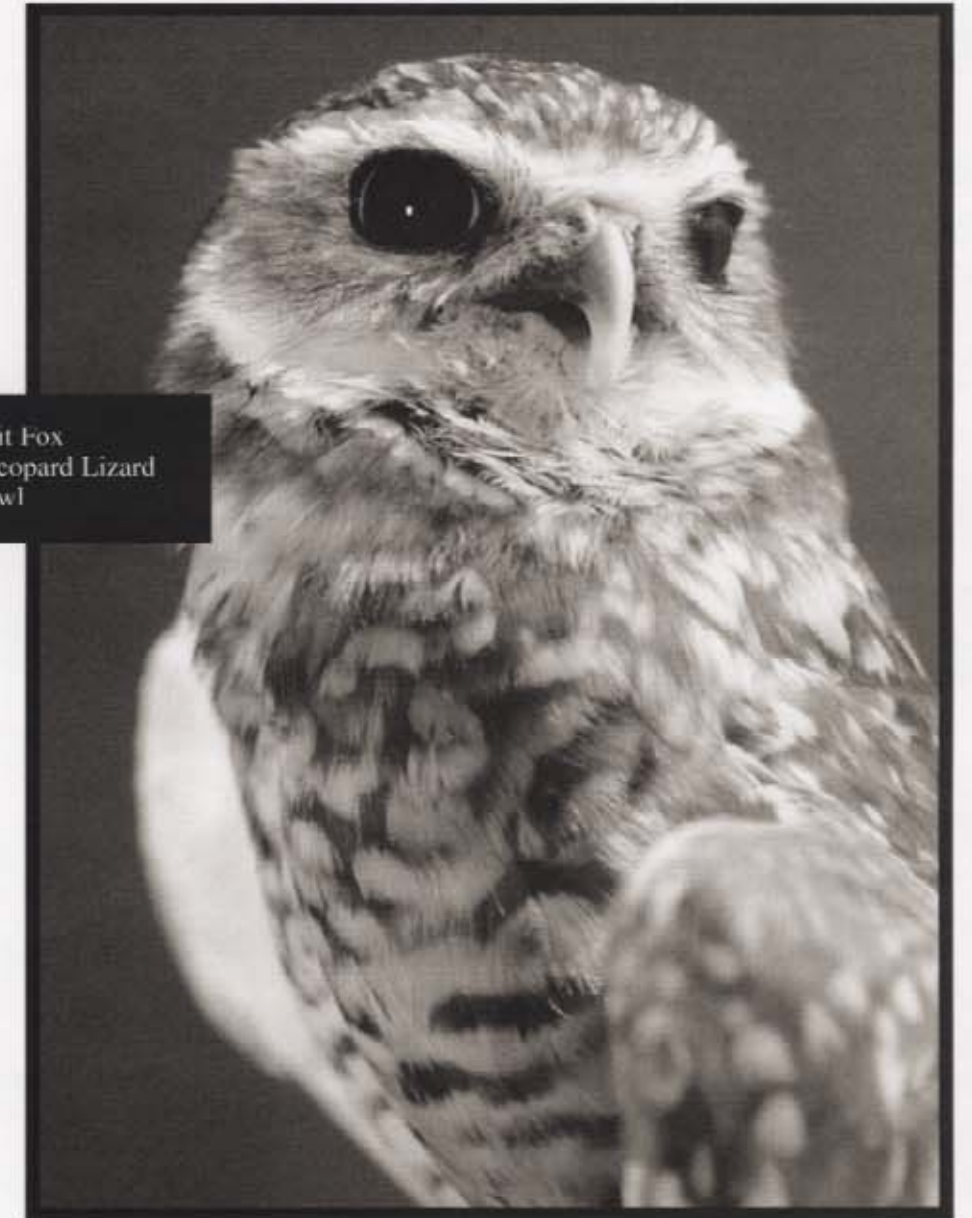
The project was closely monitored by DWR environmental specialists and the Department of Fish and Game to ensure that activities complied with permit conditions. One endangered species needed extra help. In the most unusual roundup ever held in western Kern County, the Department built a fence to corral endangered blunt-nosed leopard lizards and relocated them to other suitable habitat.



Their treks resulted in new data on wetlands and Intermittent springs in the region, the discovery of a population of a rare plant, and relocation of the pipeline to avoid sensitive areas, such as the Cholame Creek basin, a large alkali wash with extensive habitat.

By preventing problems from occurring in the first place, the Department got a head start on restoration efforts. Before final design and construction began on each segment, environmental specialists, consultants, and one of the project's designers walked parts of the entire route over a five-year period. They evaluated wetlands, streams, general habitat sensitivity, and archeological and historic resources.

"Before design began, we sought to avoid most of the sensitive sites," says environmental specialist Debra Bishop, who also helped write the project's restoration plan. Actions were taken to assure adequate protection for threatened and endangered species of wildlife, cultural resources, and the scenery of the region. Studies along the route identified 18 native ecological communities, including 22 sensitive plant species. The habitats of several state and federally endangered species were found to be within the project's boundary.



Left: San Joaquin Kit Fox
Top: Blunt-Nosed Leopard Lizard
Right: Burrowing Owl

Among the greatest concerns were pipeline stream crossings, which posed the greatest potential for wildlife and water quality impacts. The pipeline traverses 20 major streams and more than 200 small seasonal streams and drainages. Most of the drainages are dry for a majority of the year. To avoid problems, construction crews diverted water in these drainages around streambed construction sites into downstream basins where sediment was removed. Work in stream areas had to be stopped each year from November 15 to April 15 because of the rainy season. Extraordinary winter and spring rainfall in 1995 damaged some pipe and delayed other work.

The crossings of two major drainages — Santa Maria River and San Juan Creek — were particularly sensitive. Here DWR placed the pipeline underneath the streambeds using trenchless technology, a recent advance in horizontal-directional drilling methodology. A hole was first drilled and a guide pipe was inserted. Then the welded pipeline section was pulled through the hole. Slurry was then put into the borehole to prevent pipe movement.

To cross the region's main route, Highway 101 near San Luis Obispo, the pipe was jacked underneath the roadbed, eliminating traffic tieups on the busy route. Engineers also made use of an existing tunnel near 1,400-foot Cuesta Grade to avoid a more expensive new tunnel. By paying the federal government a token amount, DWR obtained the right to use an old mile-long Army water tunnel. Refurbished and lined with concrete, the Cuesta Grade tunnel is also being used for a local pipeline. Two smaller tunnels were also drilled under grueling conditions at Calf Canyon and West Corral de Piedra.

Restoration is Underway

The restoration plan's main purpose is to restore habitat lost during construction. Habitat restoration

As construction of the

Coastal Branch headed down

the home stretch, attention

turned to the long-range job

of restoring any affected

land and wildlife habitat to

its pre-project condition.

Stream restoration began immediately after construction. Difficult to restore stream banks needed temporary measures such as bundles of willow wattles, rock, floating logs, sandbags, and mulch, and may need mechanized methods such as dikes, recontouring, retaining walls, terracing, and seeding.

Work is also underway to revegetate disturbed areas. The contractors on each segment were responsible for taking immediate restoration actions, including

is achieved primarily by erosion control and revegetation. In taking restorative actions, the program seeks to maintain biodiversity, allow no net loss of habitat and plant and animal populations, stabilize disturbed areas and prevent erosion, and prevent the spread of non-native species.

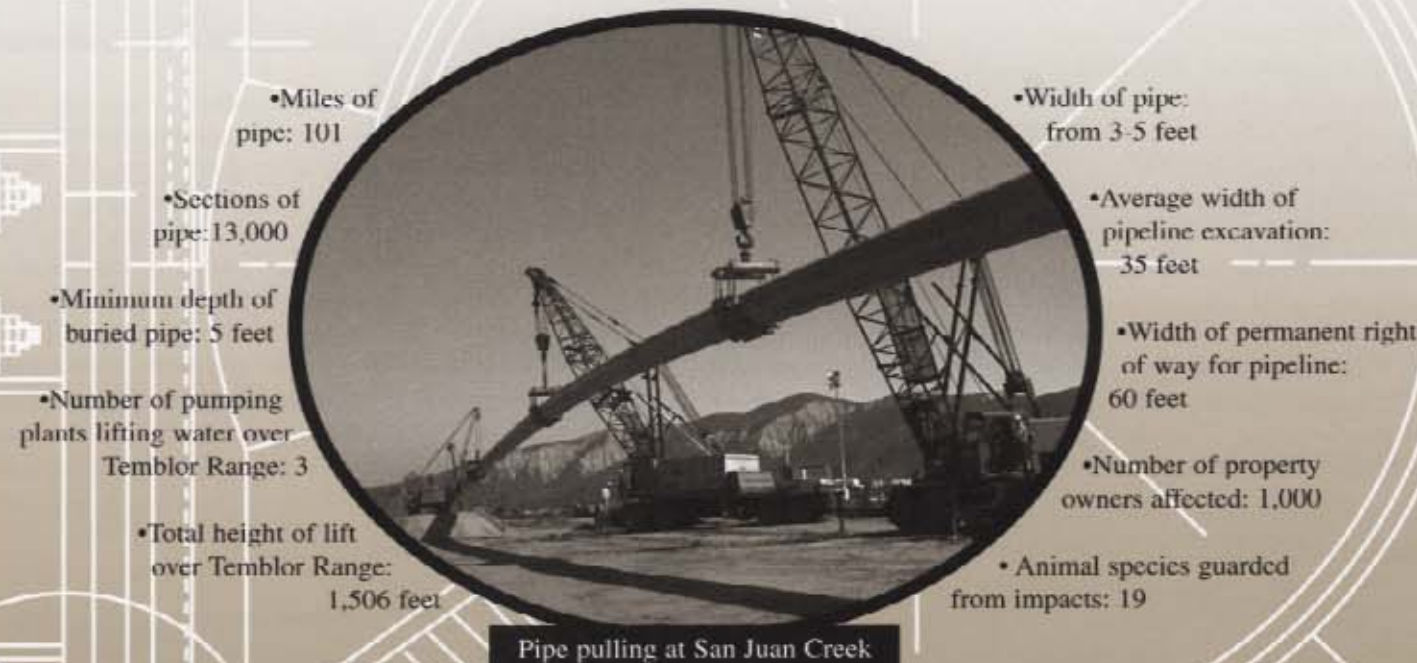
Stream restoration began immediately after construction. Difficult to restore stream banks

reseeded and erosion and sedimentation control. DWR collected seeds, cuttings, and even bulbs along the route before and after construction. Only native plants naturally occurring in the area before construction are being used, including shrubs and shallow-rooted willow trees that can be placed over the refilled trenches. DWR will closely monitor the areas for several years to make sure plants take to the soil and erosion is controlled.

By far the most controversy about the project arose over the potential loss of oaks in the Stenner Creek Canyon on the campus of California Polytechnic University at San Luis Obispo (Cal Poly). The Department and Cal Poly administrators agreed to various mitigation measures to minimize oak tree trimming and removal. Construction proceeded under strict monitoring by the university.

Oaks dotting the hillsides are a distinct feature of the San Luis Obispo countryside. To mitigate for oaks that had to be removed by the construction, the restoration plan calls for replanting, but the exact number remains to be worked out. Seedlings are being raised at the California Conservation Corps nursery in Napa and will also be raised at "The Ranch," the DWR base for restoration efforts near Arroyo Grande (see story on next page).

THE COASTAL BRANCH BY THE NUMBERS



Bringing Nature Back

40 shaded acres bisected by a rippling stream, surrounded by the rolling hills in San Luis Obispo County wine country. A lone coyote makes a rare morning appearance. For Balkow and several other employees, this will be their field office for the next few years, as they supervise post construction restoration efforts for the Coastal Branch.

Much work lies ahead for those

restoring the land and its animal

and plant life to their original

condition. It's a pastoral scene.

DWR environmental specialist

Tom Balkow leans on an old tractor

and surveys the domain.

"The Ranch," as they call it, was purchased by DWR as part of the mitigation of impacts caused by construction. The location, along Arroyo Grande Creek downstream of Lopez Lake, will be "credited" as replacement for about 150 acres of riparian habitat unavoidably lost during the project. It will also be the headquarters of one of DWR's largest restoration projects. The California Conservation Corps has planted willows, elderberries, sycamores, and cottonwoods to replace the snow peas and other vegetables once grown here. And the remaining barn and other buildings will serve as the

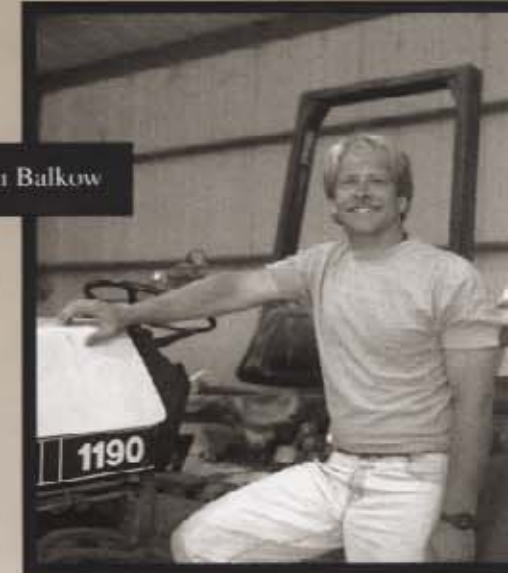
nursery for oaks and other seedlings to be planted as close as possible to the right-of-way. Acorns and other seeds collected along the route should preserve the "species integrity" and genetic diversity of the revegetated areas.

"We're going to be here for at least five years to get this going," says Balkow, inspecting a large seedbox and tools collected for the job.

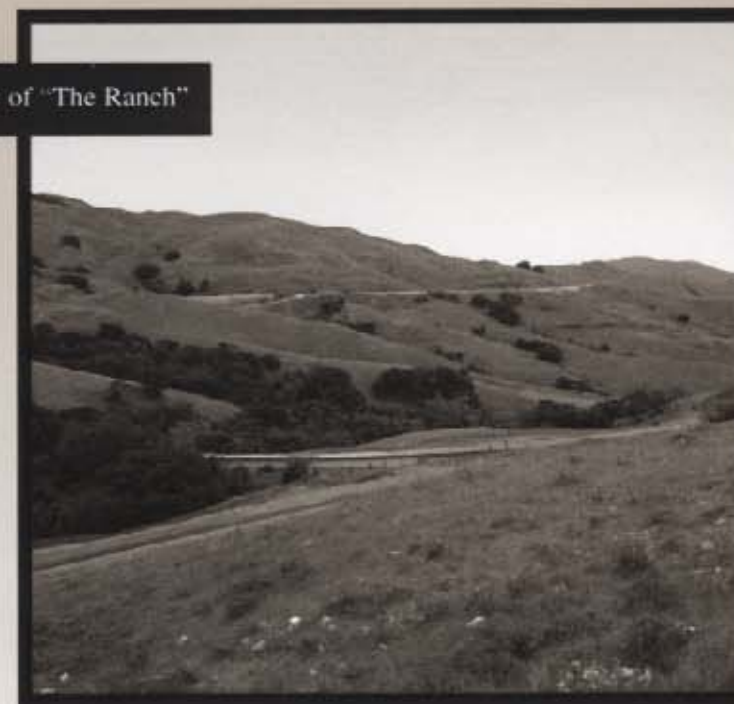
He and the others face a large task. Thousands of seedlings will be planted from acorns or by transplanting. Other seeding will be done by hand drilling or broadcasting from September through January. Erosion control and streambank stabilization must be effective.

"We will restore this agricultural land to a self-sustaining riparian forest habitat," he says. "There's a county park downstream and we hope a riparian corridor can be established in between."

Tom Balkow

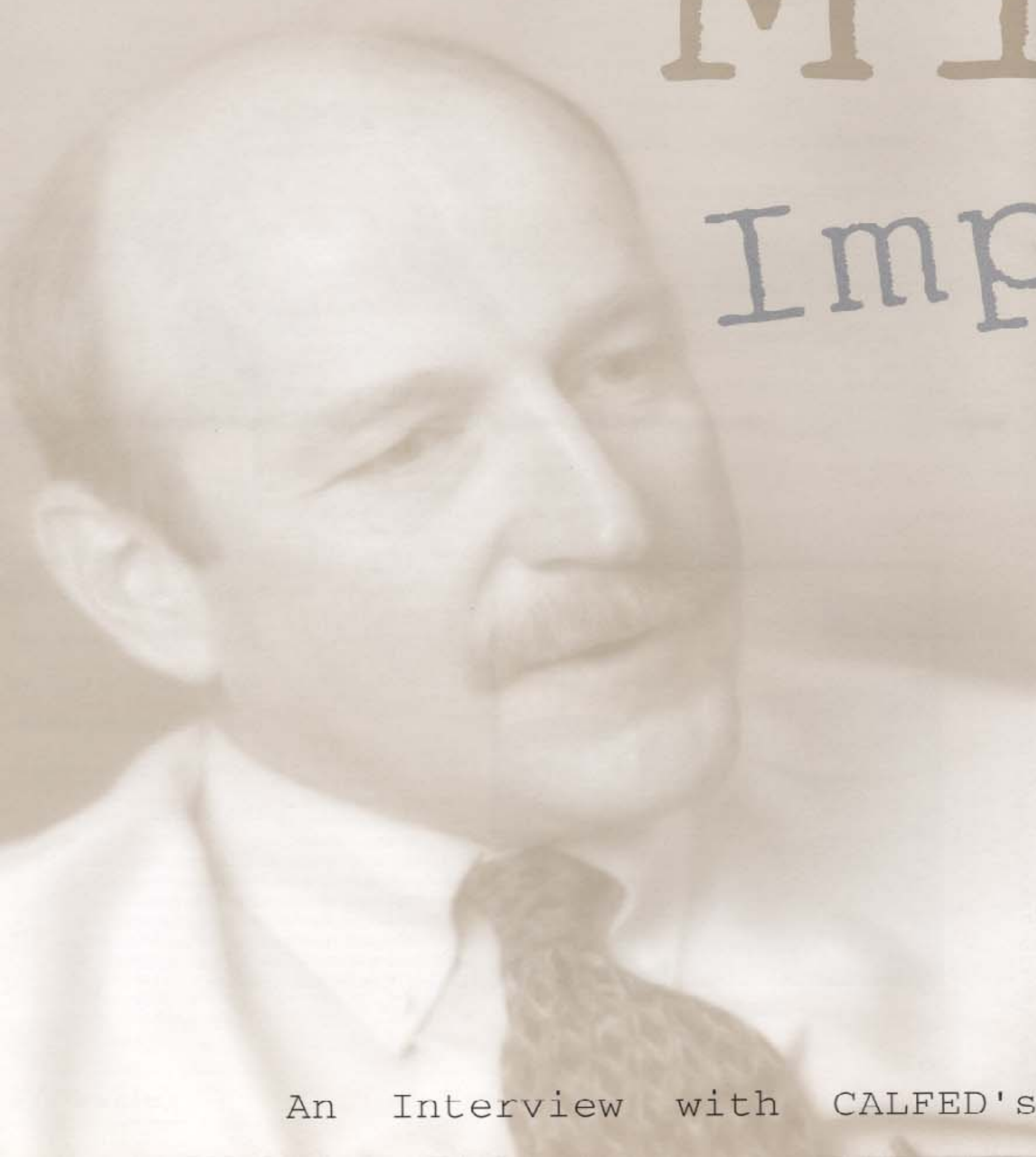


A view of "The Ranch"



The restoration program will benefit not only plant and wildlife. School groups and other local groups will be invited for nature walks in this reserve.

Mission Impossible

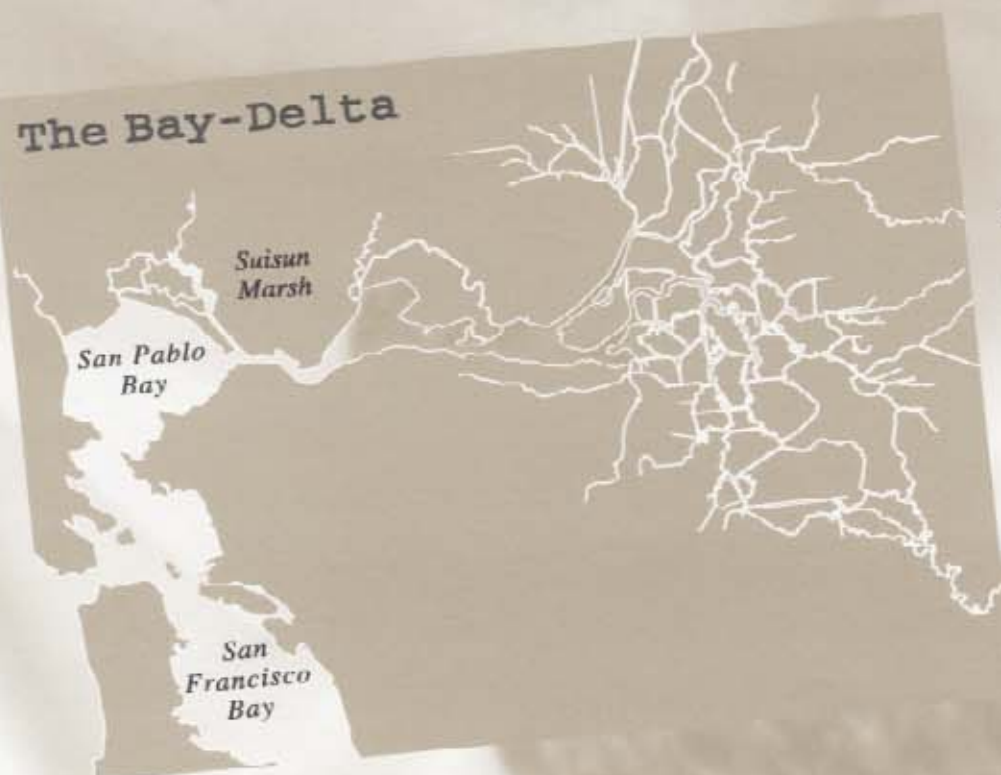


Last summer's hit movie "Mission Impossible" attracted large audiences eager to see the sophisticated M.I. team solve a seemingly impossible and complex dilemma. Meanwhile, a real life team of experts is tackling a dilemma that is every bit as daunting as the movie plot and has attracted a crowd of its own. This team's mission is to find a solution to the California Delta problem, a task many water watchers consider impossible. CALFED'S Bay-Delta Program Manager Lester Snow takes a more optimistic outlook, though he admits we may be witnessing the last chance to solve the contentious problem.

An Interview with CALFED's Manager Lester Snow

As he enters his second year with the program, Lester and the CALFED team are racing the calendar. They are charged with completing a Programmatic EIR/EIS in 1998. So far, he is on schedule. He and his staff have completed a grueling round of workshops and public meetings from Redding to San Diego that attracted more than 900 people. They have trimmed the list of possible "Delta fix" alternatives to three, and they are ready to enter the formal EIR phase.

Lester Snow has devoted his entire professional life to resource management, much of it directly focused on water resources. He received a B.S. in Earth Sciences from Penn State and an M.S. in Water Resources Administration from the University of Arizona. In 1976 he took a position as Water Quality Project Manager for the Central Arizona Association of Governments, and five years later moved to the Arizona Department of Water Resources. In 1988, Snow was selected to manage the San Diego County Water Authority, where he remained until March 1995, when he assumed his current position.



The San Francisco Bay and Delta combine to form the West Coast's largest estuary.

WHAT MAKES YOU THE RIGHT PERSON FOR THIS JOB?

I guess that in some respects everything I've done professionally has led to this. I started off working in a rural area so I understand agriculture and small community issues. I worked with groundwater management programs. I have an urban perspective having worked in San Diego. I set up some environmental programs while in Arizona. I've looked at water resource issues from different sides. This gives me a balanced perspective.

WHAT IS YOUR MISSION?

The mission is to develop a program that restores the ecological health of the system and improves water management for all beneficial uses. In the past, typically, we've picked one issue, let's say, "We need to have a healthier ecosystem," and we work on that. One of the by-products would be somebody would lose their water supply or someone else wouldn't be doing proper levee maintenance. So somebody loses and it's a zero sum game. Now we've established a mission that requires all the uses within the system to improve.

WHY DID YOU ADOPT THIS PUBLIC PARTICIPATION APPROACH WITH THE WORKSHOPS AND MEETINGS?

The fundamental issue that's guiding us is the attempt to maximize stakeholder input, and the way we developed that was observing processes that have failed. The old model is "decide, announce, defend." A small group of people would decide what's best, announce the plan, then take years defending the plan, which usually ends up in court. So we've tried to reverse that by engaging everybody up front before we even have a clue of what it is we want to do. It's been tedious for some. They want to get in and start working on the details. But we try to get a lot of input up front because we think that significantly increases our chances of success. People can then start seeing the program change as a result of their comments and perhaps feel ownership in solving the problem. It's not a guarantee for success, but the absence of stakeholder participation is a guarantee for failure.

HOW HAS IT BEEN WORKING SO FAR?

I'm very pleased with it because in my mind the test of a process is not that people participate because they like what you're doing. The real test is that you have people participating even though they think you're wrong, because they realize that there's so much at stake they want to help correct the problem. You always have a certain percentage of people who are "playing the angle" and just want to advance their issue. But I think 99 percent of the partici-

pants in this process want to see something good happen for everybody in the system. I think what people are realizing is that there's too much at stake. This may be the last chance to fashion a win-win solution.

DO YOU WORRY ABOUT LEAVING SOMEONE OUT?

We're always concerned we're not listening to an interest with something different to say. I think, early on, that was true in the rural counties, but they have significantly increased their involvement in the process. We've paid a lot of attention to them, and they're one of the groups that has brought some innovative thoughts to the table. I very strongly believe that none of us is smart enough to figure out this problem unless we talk with everybody.

YOU MUST RUN INTO SOME ANGER OR RESISTANCE. HOW DO YOU DEAL WITH IT?

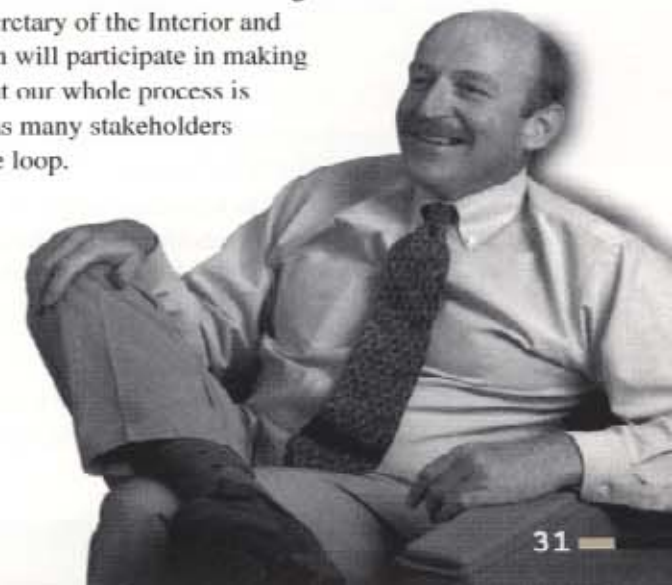
One of the first things you have to convey is that you care about what people have to say. That's how we try to conduct our meetings. We really listen and not just take notes, then file them away. We want to understand what their problems are and show them we'll try to work on them.

WHAT KIND OF FEEDBACK ARE YOU GETTING?

We get a fair amount of feedback, generally positive. Even when somebody is strongly criticizing us, as has happened, they usually end the criticism by saying, "Keep working on this. This is the best chance we have. We can't afford to fail." One more failure on this issue will be a great detriment to California.

HOW'S THE DECISION GOING TO BE MADE?

We, the program team, will make a recommendation. Ultimately, it's the ten CALFED entities that will make the decision. And since it's such a significant decision, the Secretary of the Interior and Governor Wilson will participate in making that decision. But our whole process is designed to get as many stakeholders as possible in the loop.



ARE YOU HEARING THINGS YOU EXPECTED TO HEAR OR ARE YOU HEARING NEW CONCERNS AND NEW IDEAS ?

We're hearing new ideas. I think we generally anticipated the problems, the concerns, the drawbacks that people would raise. What has been a positive surprise is that we've seen some real creativity. We've had people come in with ideas we hadn't captured before. An example would be that watershed management should play a role not only in water quality but water supply. So people are working hard to try to come up with new approaches to the problems.

WHAT SEEMS TO WORRY PEOPLE THE MOST ?

I think the biggest concern is guarantees. There's great institutional concern that only 60 percent of the package

will be implemented and therefore everybody doesn't get what was expected of it. If people fundamentally believe their issue is going to be cut out at the last minute, then there's really no

More than 300 species of wildlife inhabit the estuary.

reason for them to participate. I guess I take it as a given that there has to be some form of guarantee as part of the package.

DOESN'T THAT EXCEED YOUR AUTHORITY ?
We cannot make the guarantee, but the stakeholders can enforce the guarantee. A major stakeholder's group could take the position that unless these guarantees are part of the entire package, they will oppose it. I don't think ten governmental jurisdictions can overcome stakeholder opposition.

DESCRIBE THE TEAM YOU HAVE ASSEMBLED ?

The team came together from very diverse areas. Very different backgrounds and perspectives with respect to the Delta. We have tried to reproduce on the team the kinds of different views that stakeholders would have about the Delta system so that we can internalize some of these types of conflicts and start working on them.

GIVE ME AN EXAMPLE ?

Probably the best examples involve the issue of improving water supply and the issue of improving habitat. We brought

people in from those different perspectives so we can try to address those kinds of issues and conflicts and try to work them through. It helps us to not encounter surprises on the outside because we've been able to anticipate how people will look at a given proposal or a given project.

ANY MAJOR PROBLEMS OR OBSTACLES THAT YOU'VE RUN INTO ALONG THE WAY ?

Well, the biggest overarching issue is funding. Problems like this are big, and so are the solutions. That means they're expensive, and this is not one of the best times (economically) in this state, or even in this nation, to be dealing with large projects. But that's something we have to be creative about. In Phase II we want to develop some very specific financing strategies so it's clear when we select a particular approach, how we finance it.

WILL MONEY BE A DECIDING FACTOR WHEN MAKING A DECISION

Yes, definitely. One of our six solution principles is the affordability of a solution. A clever solution that nobody is willing to pay for is not a clever solution. The constant evaluator we use is, "Can we afford to do this?" And that's not just a yes or no question. Sometimes you can look at a program that's effective and initially it looks too expensive. But you change it a little bit, you do it over a 10-year period instead of five years, or you do a lot first and then monitor it, collect more revenues, and then do Phase II.

DO YOU THINK THE FINANCING ISSUE WILL POLARIZE THE STAKEHOLDERS AS THEY ARGUE OVER WHO WILL PAY ?

Yes. I think it's fairly natural that people want to see things done, and generally they want to pay for it with somebody else's money. But it's clear to us that a solution will not have just one funding source. It may have some general obligation bonds, it may have a federal obligation that needs to be met, or it may depend on water user fees. With so many different components, I think a financing strategy will be complex.

HOW WILL YOU OR WE KNOW WHETHER THE BAY-DELTA PROGRAM IS A SUCCESS OR A FAILURE ?

The first real test will be in late 1997 when we would expect to have a draft environmental impact statement out and if we then can continue to have a broad based consensus around a preferred alternative. I think that's at least an indication of institutional success. In terms of the natural resources, it will take years to see if the system is responding in the way we expected it to. A lesson I think we've

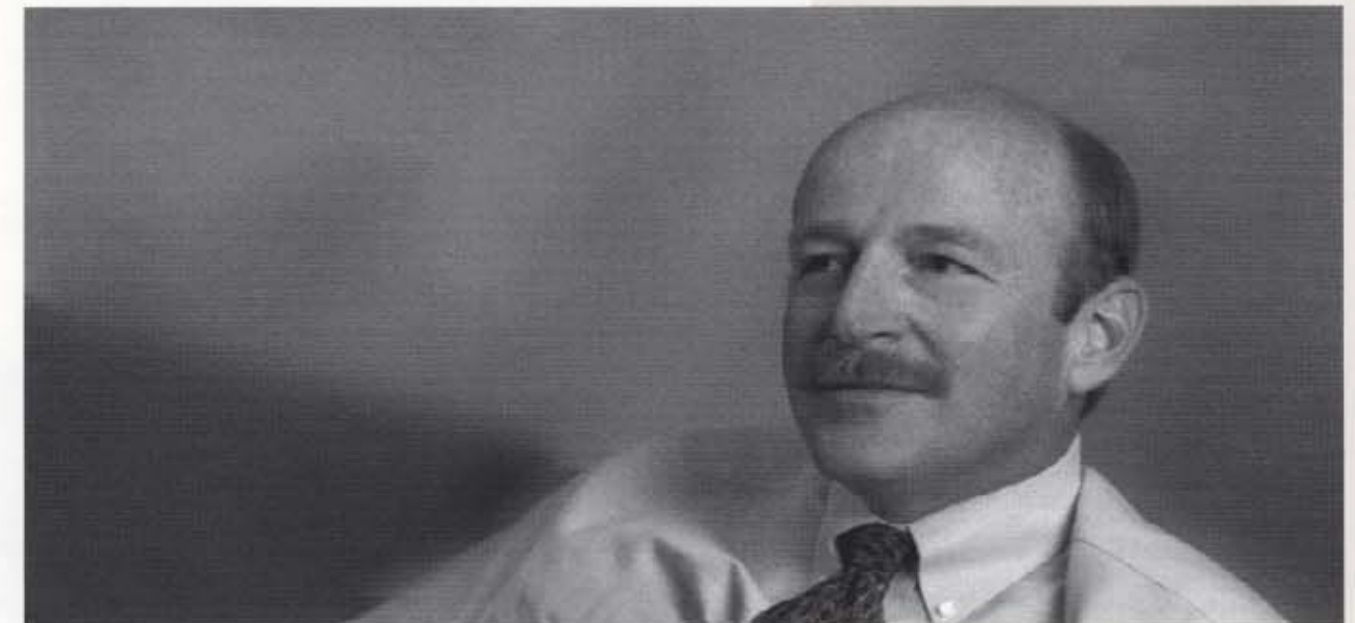
learned from the past is that you can never possess the wisdom to make a decision today that solves all the problems 30 years from now. You come up with a solution that takes your best shot at what you know today but sets up an institutional structure where they can change what's going on based on new data.

DO YOU SEE YOUR OFFICE AS PART OF THAT INSTITUTIONAL STRUCTURE ?

No, not necessarily. We structured our whole program to be temporary, to come up with a solution and then go out of business. But I think it's clear that there has to be some sort of implementing structure. That could be a consortium of existing agencies. It doesn't have to be a new agency or a new entity but there has to be a system that starts implementing the plan, evaluates the program, and makes modifications to achieve the objective.

IS IT IMPORTANT THAT YOUR OPERATION HERE GO OUT OF BUSINESS ?

Yes, I think so to avoid any concern over "empire building," that we're only proposing this program so we can add more staff or raise salaries or whatever. So I think it's not just important, but probably essential that everybody understands that the program will disappear at some point.



"This may be a last chance to fashion a win-win solution," says CALFED's manager Lester Snow, who is hopeful of finding a workable plan to fix the Bay-Delta.

Of Different Times

By Joyce Tokita

The year was 1951. Post World War II industry and development were booming. California's population numbered around 10.5 million. Agriculture's more than 6.5 million irrigated acres were growing crops like alfalfa, cotton and oranges. Television was becoming a common household appliance. The federal government was building the Central Valley Project, and the State Legislature funded studies for a state water project.

Such events marked the era when the Department released Bulletin 1, an inventory of the state's water resources, eyed by many as a key to the state's future economic prosperity. Within its more than 600 pages, Bulletin 1 contained nearly 50 years of accumulated data on California's precipitation, river flows, floods, and surface and groundwater resources.

Much has changed since then. Today, businesses are downsizing and watching the bottom line. California is home to more than 30 million people. Its 9 million acres of irrigated farmland grow 50 percent of the nation's fruits, nuts and vegetables. The Internet provides computer-based entertainment and information to a "web-surfing" generation. And the State Water Project, whose initial facilities were completed in 1973, is now among the nation's largest water development systems.

Though time progressed and events changed, Bulletin 1 did not. Its data remained stuck in a past era—that is, until recently. In 1998, DWR's Division of Planning will publish an updated Bulletin 1, which will encompass the data amassed between 1945-94 and provide water planners with a resource that will prove invaluable in the years to come.

A Bit of History

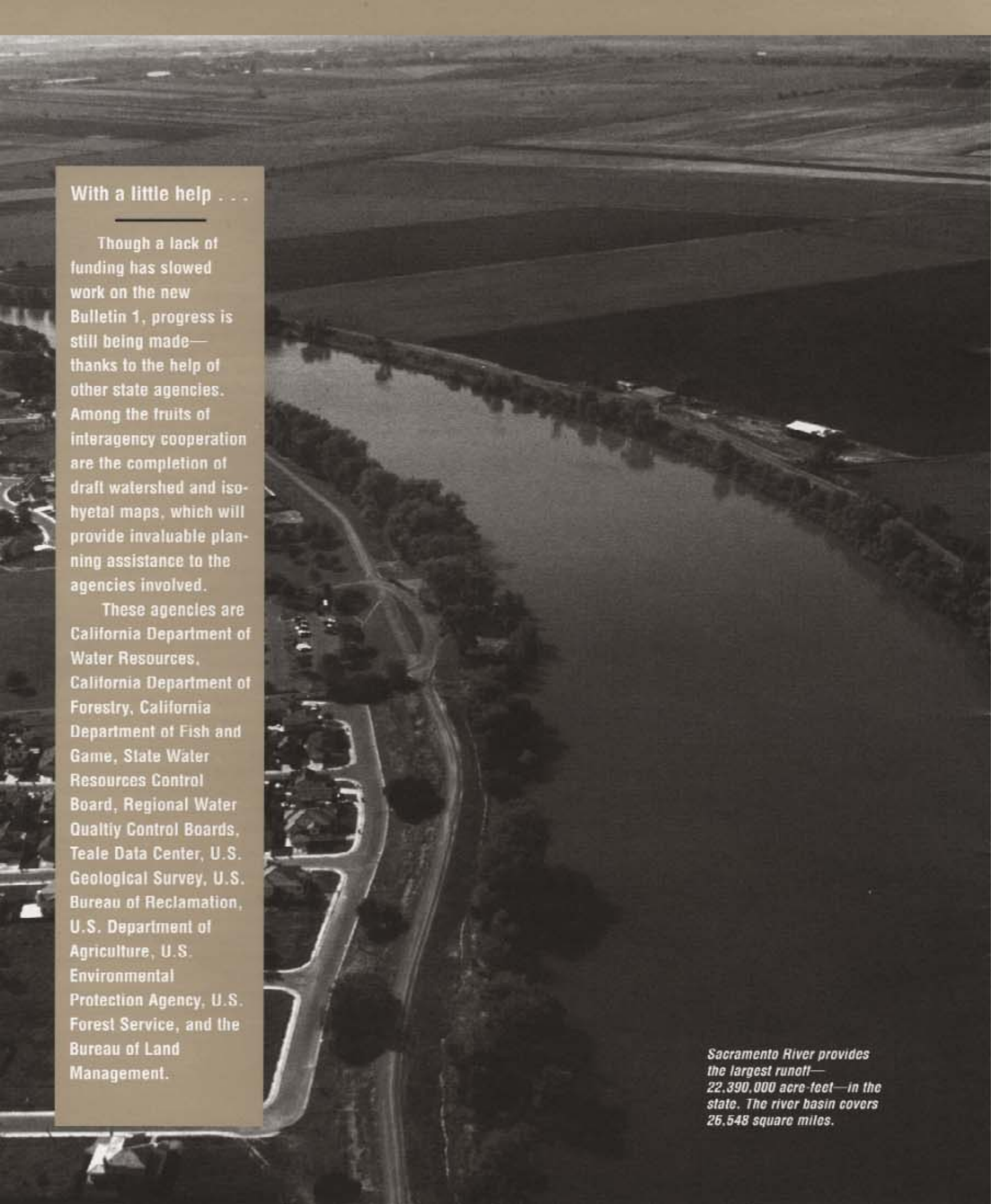
In 1945, the California Legislature directed the State Water Resources Board to conduct an investigation of the state's water resources and to prepare plans on how to control, conserve, protect and use such resources to best benefit its people. Carried out by the staff of the Department of Public Works, Division of Water Resources (precursor to DWR), the "Statewide Water Resources Investigation" would spawn three bulletins that would pave the way for construction of a state water project.

Bulletin No. 1
WATER
RESOURCES
OF
CALIFORNIA
1951

With a little help . . .

Though a lack of funding has slowed work on the new Bulletin 1, progress is still being made—thanks to the help of other state agencies. Among the fruits of interagency cooperation are the completion of draft watershed and isohyetal maps, which will provide invaluable planning assistance to the agencies involved.

These agencies are California Department of Water Resources, California Department of Forestry, California Department of Fish and Game, State Water Resources Control Board, Regional Water Quality Control Boards, Teale Data Center, U.S. Geological Survey, U.S. Bureau of Reclamation, U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Forest Service, and the Bureau of Land Management.



Sacramento River provides the largest runoff—22,390,000 acre-feet—in the state. The river basin covers 26,548 square miles.

The first, the 1951 Bulletin 1, "Water Resources of California," inventoried the state's water resources—drainage basins by major hydrographic areas, conditions relating to precipitation and runoff, levels of precipitation and runoff recorded from 1895 to 1947, estimates of potential flooding along major waterways, and the quality and suitability for development of surface and ground water resources.

Bulletin 2, "Water Utilization and Requirements of California," followed in 1955 and included estimates of statewide water use for all purposes (urban, agriculture, industry, etc.) and presented forecasts of water requirements based on predictions of future development.

Two years later Bulletin 3, "The California Water Plan," was published. It presented preliminary plans for developing all of the state's water resources to meet its ultimate water needs. Those plans included local development projects and a system of reservoirs, aqueducts, pumping and power plants that would transport water from areas of surplus in the north to the water deficient south.

In later years, data from Bulletins 2 and 3 would be incorporated and updated regularly by the Bulletin 160 series, but Bulletin 1 would not see a new printing for another 50 years.

The Need for Another

"Bulletin 1's extensive inventory of how much water flows in the state's rivers forms the basis for water resources planning in California," says Naser Bateni, program manager of the Department's Statewide Planning Program and coordinator of the California Water Plan Updates. "Because we increasingly recognize that projected water demands will exceed supplies, we must reevaluate California's water inventory so that we may have more accurate tools to better manage this precious resource. And that's where Bulletin 1 comes in."

So why has it taken so many years to decide to publish a second edition?

"It's a huge task," says Bateni, who pushed for the project from its beginning. "It's not simply a matter of collecting the data and publishing it. We have to evaluate the data, crunch the numbers, and that takes a long time."

. . . we must reevaluate California's water inventory so that we may have more accurate tools to better manage this precious resource . . .



The Trinity River Basin encompasses a watershed of almost 3,000 square miles in Trinity and Humboldt counties.

The data in fact are readily available, having been collected by an array of agencies. They include federal agencies such as U.S. Geological Survey and the National Weather Service, local entities like cities and counties, and water agencies statewide. "For example, precipitation data is coming from more than 1,000 stations located throughout the state, and these stations are operated and maintained by a variety of local, state and federal agencies," explains Bateni.

But a huge database is not the determining factor of its accurate analyses.

"You need long-term data . . . continuous and high quality data is ideal. Agencies can move data stations or install stations only to discontinue them. You have to strike a balance between the length of data records you'd like and the availability of high quality records," he adds.

Bateni and staff have now turned their attention to completing an extensive evaluation of the data collected, including defining watershed boundaries of various streams and analyzing precipitation information for more than 200 river basins.

The evaluations will also produce maps—a master watershed map of California and a 50-year isohyetal map showing precipitation distribution over the state. These maps will prove critical to future water planning for state or federal and local agencies.

"Both maps are being digitized and will eventually be made available through the Geographic Information System and a DWR web site," says Bateni. "Using the GIS, you will also be able to overlay the isohyetal map on the watershed map and calculate precipitation volume for a region like the entire North Coast or for a specific area such as the Trinity River above Lewiston."

Bulletin 1 will also describe California's climate and its variation over the state, discuss groundwater resources and its relationship to surface water, and summarize statistics on water supply deliveries from water projects statewide.

Persistence and Cooperation

While funding and work on the Bulletin 160-98, their major focus, have prevented full-time commitment from DWR staff, they are not alone in this daunting task.

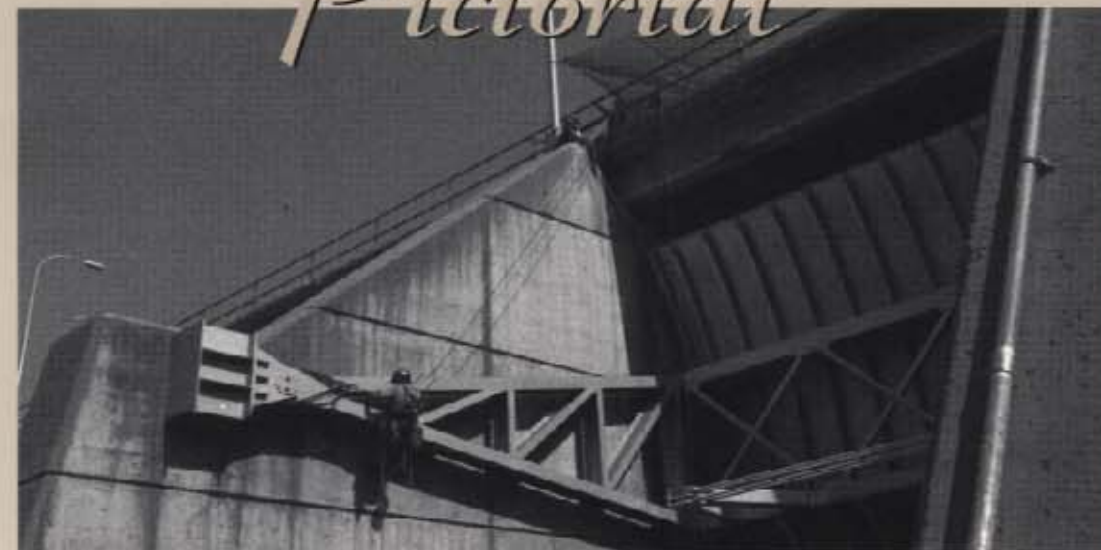
"We established an interagency group (see "With a little help . . ." on Page 36) that helped in delineating and digitizing the watersheds," says Bateni. "Each of these agencies will put their stamp of approval on the watershed map, which will then serve as a base map for all planning studies in the state by various agencies. Their cooperation and contribution of staff time have been indispensable."

For Nasir Bateni and his staff, Bulletin 1 is well worth the effort. "The work is challenging, and the product will definitely be a valuable resource," he says. "It was an opportunity that I knew I had to grab when it came up, because there may not be another chance for a long time."



Groundwater provides roughly 25 percent of California's urban and agricultural average annual supply.

Pictorial



When a radial gate on Folsom Dam failed in July 1995, the event shook the confidence of some DWR design engineers. "We've always taken for granted that the radial gates operated safely," says Tom Glover, a supervising engineer and chief of the Division of Engineering's Dam Projects Section. "The failure of Folsom spillgate really brought to our attention the need to reevaluate the structural stability and the operation and maintenance history of the gates."

The concern focused on State Water Project dams with radial gates, many of which are 25 plus years old. "We do routine maintenance inspections, but we don't examine every weld, bolt and structural member," says Glover. "It was time

At the end of the line...

to look at the original analysis and update them to modern standards."

So DOE, working with the Division of Operations and Maintenance, decided a thorough inspection was required for the 37 radial gates within the SWP system. (The majority are located in the Oroville Complex, with 14 at the Thermalito Diversion Dam in the photo).

Getting close to these gates was the challenge. It meant learning how to use a rope and harness to climb and hang in front of a gate while searching for defects or weak spots. Add to that some 50 pounds of climbing hardware and inspection gear needed for the inspections.

Six engineers—three from O&M and three from DOE—volunteered. After two weeks' training with a bridge and maintenance group from Caltrans, experienced in rope and harness techniques and structural inspections, they were ready. Inspections of all of the SWP's radial gates started in May and should be completed by the end of 1996.



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